

# Plans and Progress on AIRS assimilation at DAO

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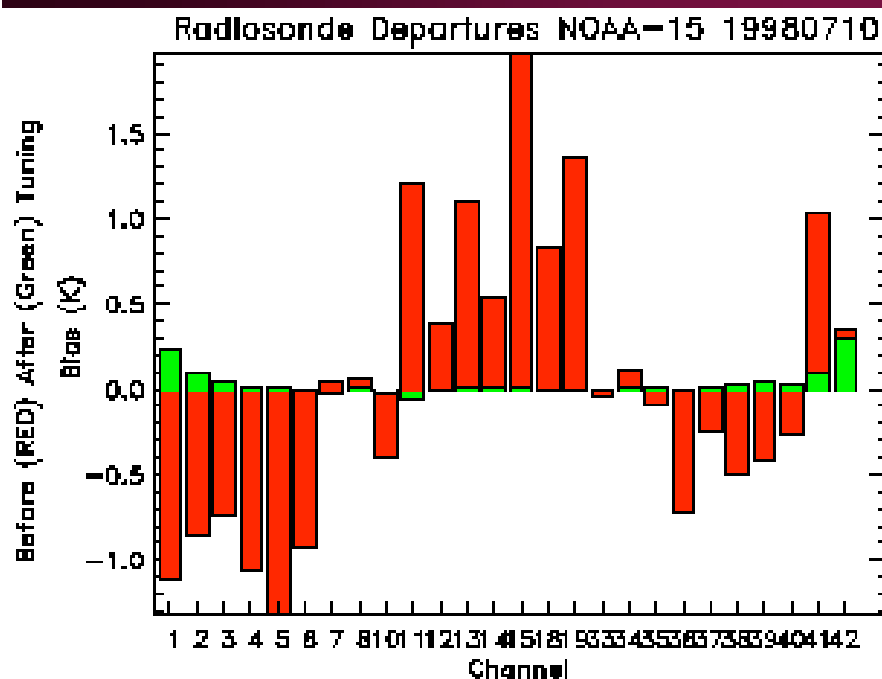
# Progress Report since last meeting

- Web-based monitoring of radiance/retrieval biases, quality control decisions, and coverage
- Implemented OPTRAN
  - Tested with TOVS
  - Began testing with simulated AIRS data
- Software completed to read and archive level 1b test data sets from NESDIS and compute observed minus forecast radiances
- Received level2 test data sets from NESDIS, software nearly complete for assimilation
- Began modifications to DAOTOVS software to incorporate AIRS
  - Testing with internally-synthesized radiances

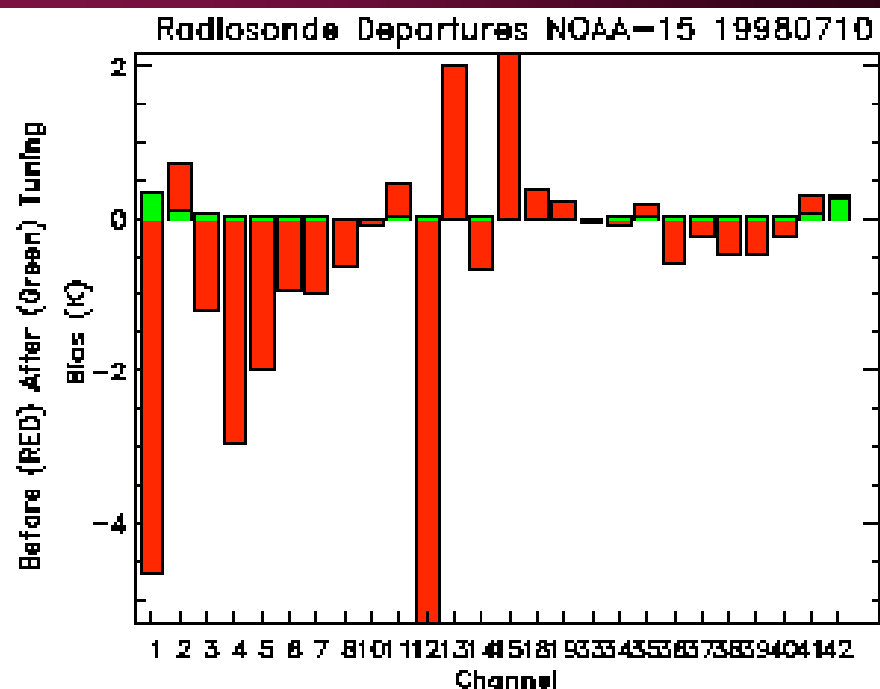
# Features in NESDIS 1b data sets

- Some strange radiance values (noisy) are seen over e.g. Greenland
- Emissivities significantly different from Masuda ocean model or CERES land emissivity data set?
  - Radiances in clear scenes fail cloud-detection checks, especially over ocean
  - Most retrievals fail radiance residual checks

# OPTRAN significantly reduces ATOVS radiance biases: note: a) scale b) large reduction in channel 1 and 12 biases

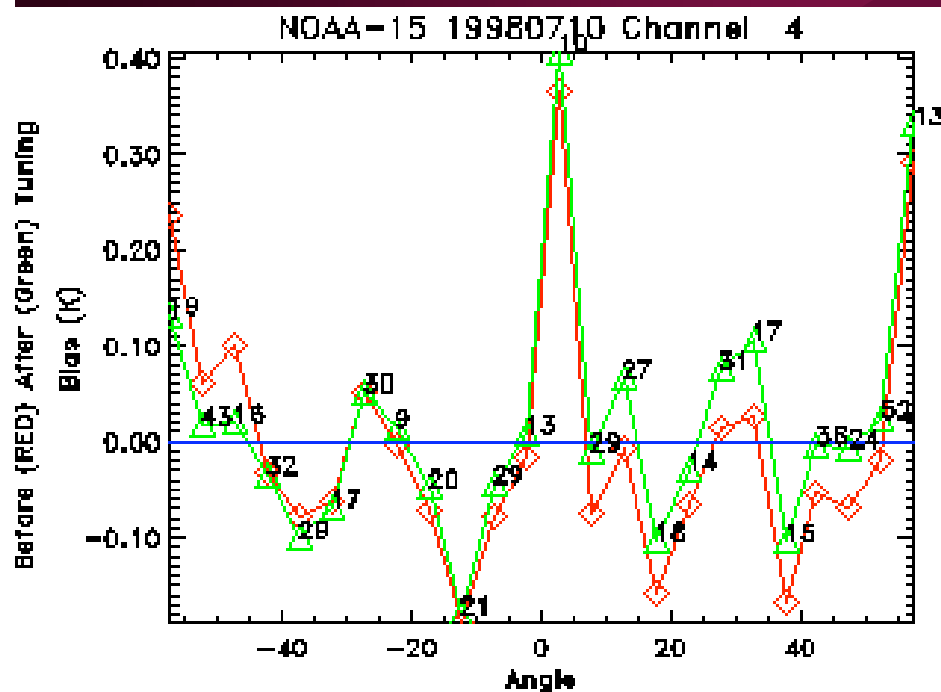


OPTRAN

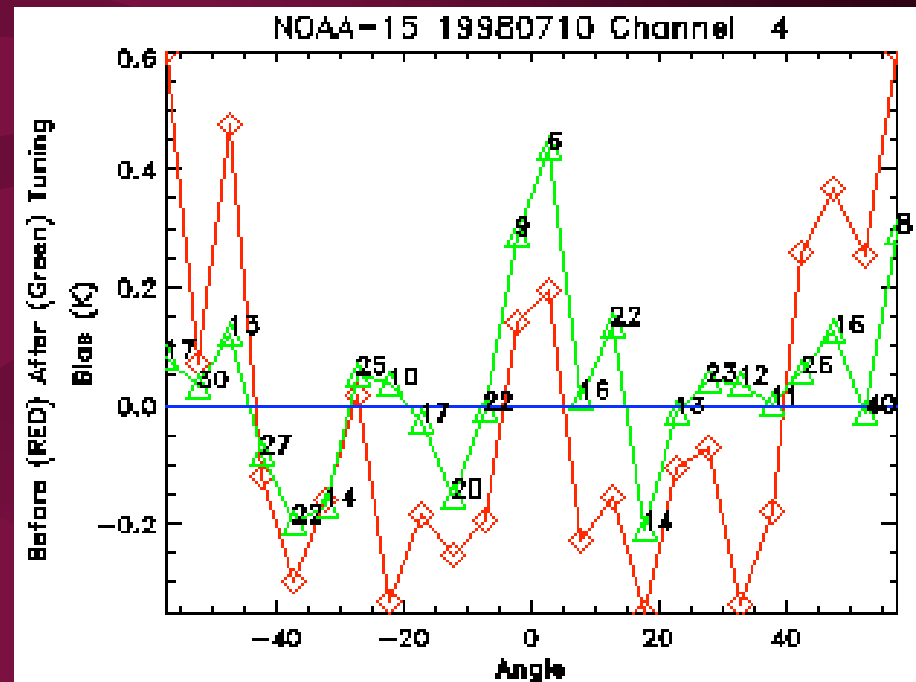


GLATOVs

# Scan-angle-dependent biases (red: before tuning, green: after)

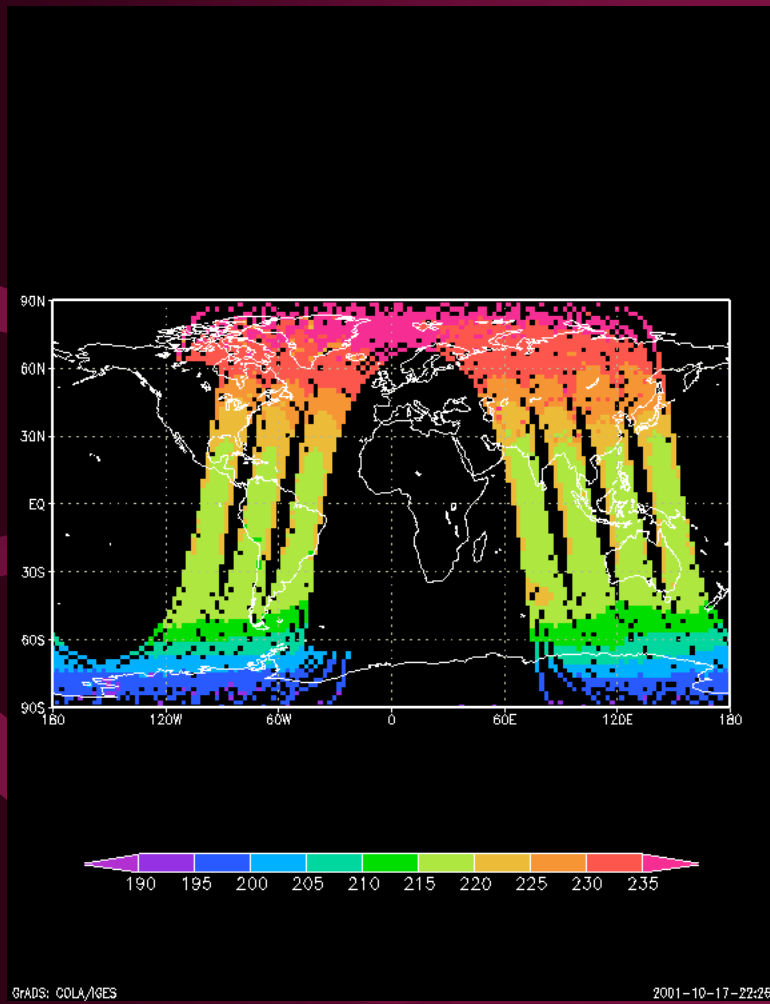


OPTRAN



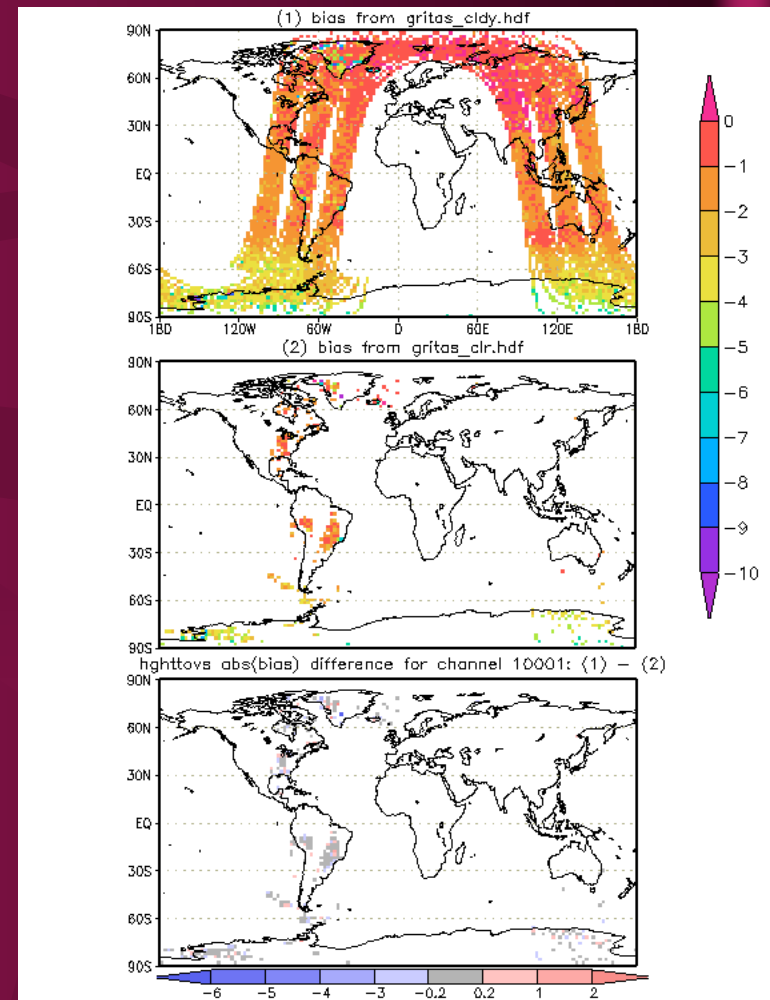
GLATOVs

**Radiances (O-F)  $649.6 \text{ cm}^{-1}$  (note: noisy values over Greenland, middle right shows where passed cloud-detection checks, less strict over land)**

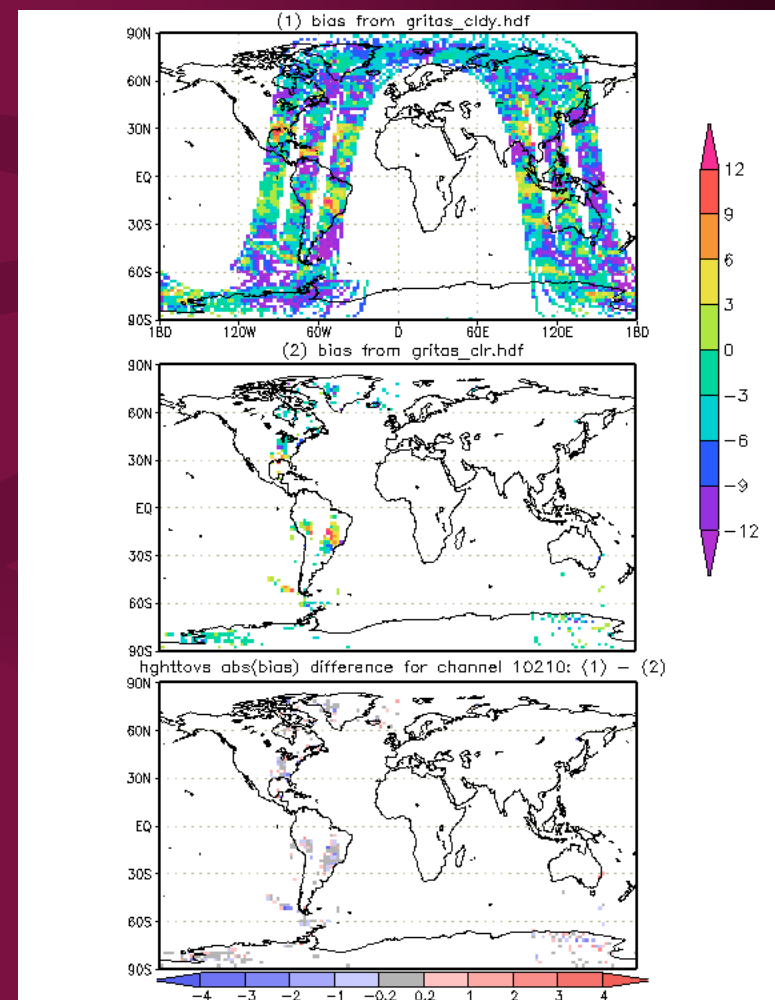
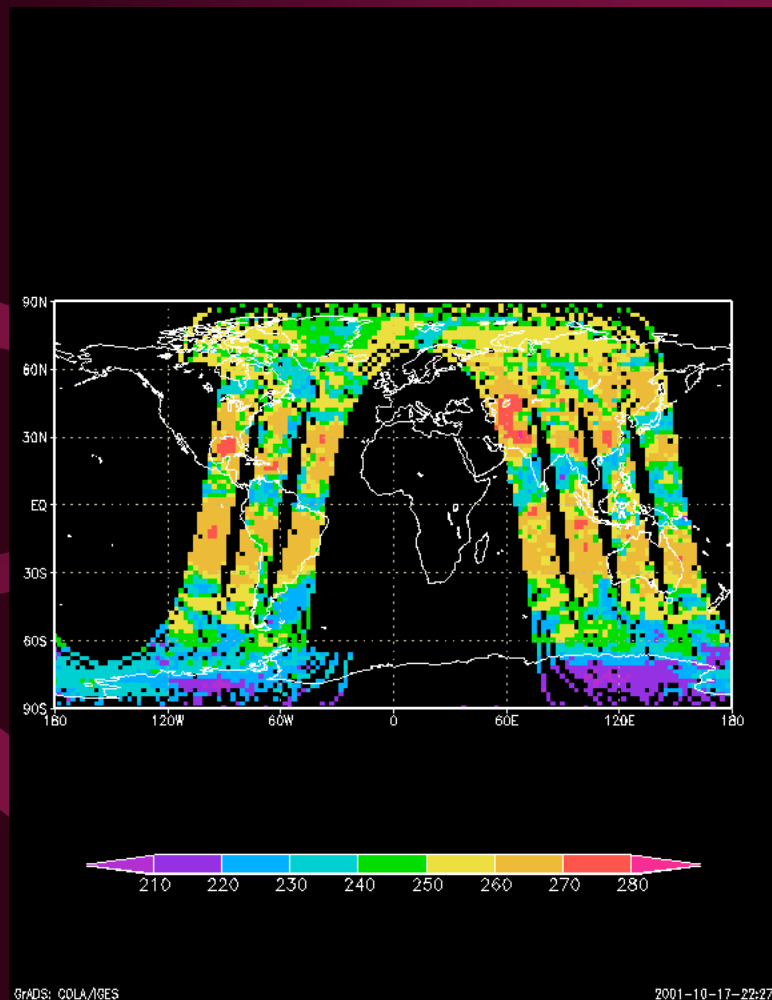


November, 2001

AIRS meeting, Joanna Joiner



# Left: Obs 801 $\text{cm}^{-1}$ (window), Right: O-F 1571.9 $\text{cm}^{-1}$ ( $\text{H}_2\text{O}$ )



# DAOTOVS 1DVAR system

- Uses raw (level 1b) data
- Variational cloud-clearing (**Joiner and Rokke, 2000; <http://dao.gsfc.nasa.gov/pages/jjoiner.html>**); eigen-vector FOV determination (**AIRS ATBD**)
- Physically-based systematic error correction (tuning)
- Forward models: OPTRAN, as well as GLATOVS, HFFP, and MIT microwave code (e.g. use HFFP/MIT for OSSE simulations, OPTRAN for retrievals)
- Runs in operational GEOS-DAS and next-generation Finite-volume DAS (FVDAS), currently running in parallel system

# **DAOTOVS and treatment of retrievals at DAO: What makes it different?**

- **Uses cloud- and land-affected data (using CERES land-emissivity data set based on satellite/laboratory measurements). Positive impact shown at last meeting.**
- **Variational cloud-clearing (clearing done simultaneously with retrieval); allows for internal quality control, consistency, simplicity; examples shown at last meeting.**
- **Tuning using collocated radiosondes (not background). Updated daily.**
- **Data are thinned on an equal-area grid; best retrieval selected (e.g. clear over cloudy); sounding data marked as passive near sondes so as not to underweight sonde**
- **Errors in assimilation system include separate components with and without vertical/horizontal correlations**

# Cloud detection

- Background window channel check (Derber and Wu)  
 $|O-F(\text{HIRS8})| < 1\text{K}$  sea,  $< 3\text{K}$  land
- Albedo check from VIS channel and frozen sea test (McMillin and Dean) – any way to put visible channel info into 11b data sets?
- Long-wave/short-wave consistency checks (Eyre, McMillin and Dean, others internally developed)
- FOV homogeneity check (if passes, average all FOVs), otherwise take 1 FOV as clear if passes all tests
- Implemented for AIRS using representative long-wave short-wave window channels
- Working on microwave/IR consistency check for AIRS/AMSU
- Less than 10% found clear, less than half of those clear in all 3 FOVs

# Summary and Future Work

- **OPTRAN** implemented with good results. Used to compute O-F radiances using NESDIS data sets
- **DAOTOVS 1DVAR** is in process of being adapted for AIRS; simplified system working with internally-simulated data
- **DAO** has developed a variety of web-based validation tools (O-F radiance-retrieval, QC monitoring, forecast-synoptic evaluation, etc.); will be used to evaluate AIRS team retrievals and level 1b radiances (will be available to AIRS team members)
- **Working on upgrades for AIRS (dynamic channel selection using cloud-height determination)**
- **Designing experimental setups (different channel subsets)**

